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Title of Invention: Free flowing particulate yeasts and use of these novel yeasts in frozen doughs

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FROZEN BAKERS YEAST

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(57) Claim

1. A frozen baker's yeast in the form of free flowing particles having a diameter of less than 3 mm and a dry matter content of from 70 to 85 percent by weight.

5. A process for the manufacture of frozen baker's yeast according to any one of the preceding claims, which comprises:

a) dividing by extrusion fresh yeast into individual particles of less than 3 mm in diameter and bringing the particles by gentle drying to a dry matter content comprised between 70 and 85 percent by weight;

b) cooling quickly and freezing the dried particles to a temperature of between -5°C and -30°C by fluidization in an air flow at a temperature between -10°C and -40°C; and

c) recovering the frozen particles.

10. In a process for manufacturing frozen doughs wherein yeast is added to dough and the resulting mixture is frozen to yield a frozen leavened dough, the improvement consisting of adding the baker's yeast of any one of claims 1 to 4 to the dough prior to the freezing of the dough.

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COMPLETE SPECIFICATION

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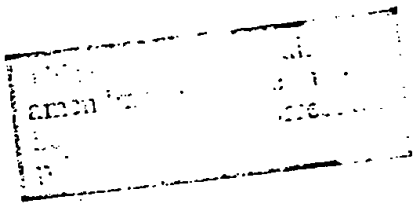

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Complete Specification for the invention entitled:

FREE FLOWING PARTICULATE YEASTS AND USE OF THESE NOVEL YEASTS IN FROZEN DOUGHS

The following statement is a full description of this invention, including the best method of performing it known to : us

FREE FLOWING FROZEN PARTICULATE YEASTS AND USE OF THESE NOVEL YEASTS IN FROZEN DOUGHS

The invention relates to a novel form of baker's yeasts, combining the advantages of fresh yeasts and dried yeasts. It relates to frozen yeast having a dry matter ~~content between 30 and 85%, preferably of at least 70% and more~~ content between 70 and 85% preferably between 72 and 80% in the form of free-flowing particles incorporable directly in doughs. The invention also relates to the process for obtaining said novel yeasts and their use in the manufacture of frozen doughs.

Baker's yeasts are marketed essentially in two forms:

. in the form of fresh yeast having a dry matter content between 27 and 35% occurring in blocks of 500 g or 1 kg, or in divided form (bulk yeast or crumbled yeast) in bags of 11 to 25 kg. So that fresh yeast remains in divided form and does not reagglomerate, it is often necessary to add to it a certain nomber of additives as indicated in British patents 1,530,866 and 1,560,478 or European patent application No. 0,153,117. This fresh yeast preserved at 4°C must be used at the latest within one month and preferably within a period of two weeks. In practice, the storage conditions of fresh yeasts are rarely ideal and this reference temperature of 4°C is poorly respected. Besides fresh yeast which has to be preserved at +4°C, there exists marginally a commercialization of fresh yeast in blocks of 500 g or 1 kg in frozen form. The freezing obligatorily results in blocks of yeasts; the bulk form divided yeast even with additives, agglomerates into blocks on freezing. This yeast must be thawed to be incorporated in doughs and used very rapidly after thawing. The freezing-thawing treatment is slightly penalizing for the yeast and the use of frozen yeasts in block form is inconvenient.

. in dried yeast form with at least 92% of dry matter. Active dry yeasts have the drawback of having lost a part of their gassing power during the drying and the membranes of the yeast cells are more or less altered. They have the advantage of long preservation, the best performing instant dry yeasts packaged under vacuum or in neutral gas have a loss of fermentative activity or gassing power of the order of 1% per month at 20°C. These dry yeasts must always be rehydrated in a dough or in a liquid at at least 16°C.

The prior art illustrated by U.S. patent 3,089,774 comprises an attempt to prepare a yeast having an intermediate moisture content, but this intermediate humidity yeast is not being produced, at least in Western countries (Yeast Technology 1973, Reed and Peppler, page 94); its preservation properties are not sufficiently greater than those of fresh yeasts having about 30% of dy matter, preserved at +4°C. In addition these yeasts with intermediat humidity are very sensitive to temperature rise.

The invention consists in freezing by fluidization a divided baker's yeast, so as to bring down the yeast particles from a temperature equal to 0°C or positive to a temperature between -5°C and -30°C, preferably to -18°C or -20°C in a time comprised between 5 minutes and several hours, for example between 7 and 120 minutes or between 10 and 40 minutes.

The freezing by fluidization in a flow of air or of neutral gas between -10°C and -40°C, preferably between -20°C and -40°C and still more preferably between -18°C and -30°C, permits, on the one hand, rapid heat transfer between the gas and the solid (the yeast particles in a fluidized bed) without resorting to very low temperatures destructive of the yeast and, on the other hand, the individualization of the particles which do not become reagglomerated. It is this latter characteristic of the fluidization which is the most interesting, since the yeast

easily supports a slow drop in temperature and since it be
preferable that freezing is not too rapid. fre

~~This process can, if need be, be applied to fre~~ pr
compressed baker's yeasts having a dry matter conter th
between 30 and 40%, preferably of at least 35%, produce i
so as to be non-sticking and hence to be fluidizabl
without agglomerating. Great care must be taken in th
design of the fluidized bed freeze apparatus and in the
operations of fluidization of these fresh yeasts so as to
obtain well individualized particles. The freezing must
not be too rapid, the drop in temperature when the tempe-
rature is lower than 0°C must not be more than 1°C per
minute. The products obtained will still have a tendancy
to coalesce into clumps or lumps and even to agglomerate
~~completely, which is a considerable drawback.~~

This process applies preferentially to pre-dried yeasts which do not present any difficulty in fluidiza-tion. The pre-drying will also have the advantage of re-ducing the cost of storage and of transportation of these frozen yeasts due to the fact of their lower weights. Pre-drying to at least ~~72%~~ 70%, ~~and~~ preferably 72% and still more preferal at least 74% of dry mater will guarantee against all risk of coalescing into clumps in packages and will make the yeast particles remain perfectly free-flowing.

This pre-drying can be conducted until the appear-ance of degradation of the cell membranes due to the fact of the elimination of internal water from the yeast cells. It must never exceed 85% of dry matter and preferably it will be continued up to about 77% of dry matter, that is to say in order to obtain between 74 and 80% of dry matter.

The pre-dried baker's yeast having a dry matter content comprised between 70 and 85% must be cooled as quickly as possible until a temperature comprised between -1°C and +4°C, as yeasts having these dry matter contents incline to become heated very quickly and they should not

be left at temperatures higher than 15°C. Furthermore the freezing speed of the yeast is not a critical parameter provided it is not too rapid. In other words, as soon as the said speed is longer than about 5 to 10 minutes, there is no difference in the properties of the resulting yeast if the drop in temperature from 0°C to -20°C takes 10 minutes or 12 hours.

The freezing in a fluidized bed of yeast pre-dried to a dry matter content between 70 and 85%, preferably between 72 and 80%, hence of yeasts no longer containing external water or weakly bound water, considerably reduces the risk of crystallization which can affect the integrity of the cells.

The particulate frozen baker's yeasts in their preferred form having a dry matter content between 70 and 85%, preferably between 72 and 80% and still more preferably between 74 and 80%, have the advantages:

. of being easy to handle and to incorporate or to disperse directly in the dough without prior thawing,

. of preserving practically indefinitely the properties of the initial fresh yeasts, taken as they com out of production.

The particulate frozen yeasts, according to the invention, are particularly advantageous for the manufacture of frozen doughs intended to be preserved several months, then to be thawed, fermented and baked. Studies done in the Applicants' laboratories have shown that the manufacture of these frozen doughs requires, to obtain bread-products having uniformly and reproducibly the desired development, the use of yeasts rich in reserve substances, particularly in trehalose and having intact membranes. In practice, taking into account the distribution circuits, fresh yeasts can only be used several days after they leave the factory, and often they have not been fully maintained at 4°C, but rather at temperatures of the order of 10°C. Consequently, the results obtained

under No. 8,554, or as indicated in example 2 of U.S patent 4,370,420 or in the examples of the U.S. paten 4,396,632, these patents being incorporated by reference.

A yeast having a dry matter content of 33% an containing 7.3% of nitrogen on dry matter is obtained. To this yeast is added a fine emulsion constituted by sorbitol esters or polyglycerol esters in a proportion of about 1.5% with respect to the dry matter of the yeast. It is extruded through a grid having perforations of width 0.5 to 3 mm, preferably 0.5 to 1 mm, and it is dried to about 75 to 78% of dry matter by a particularly gentle or mild drying that is to say a drying where the temperature of the yeast does not exceed 35°C and preferably 30°C.

The yeast vermicelli having about 75 to 78% of dry matter are transferred into a vibrated fluidizer supplied with air at -25°C by a refrigerator unit, the whole being carefully heat-insulated or placed in a thermostated enclosure.

In general, it is possible to employ a fluidizer of design identical with those used customarily for the drying of yeasts by fluidization, the essential difference being its supply with air at a negative temperature. The principle used is the same: through the solid product (the particulate yeast) is made to pass an ascending flow of a fluid (air at a negative temperature, for example -25°C) whose speed balances the weight of the solid product and will ensure expansion of the layer of individualized and mobile solid particles into a fluidized bed.

There is noted in the freezing in fluidized bed an increase of the dry matter content of the yeast particles comprised between 0 and 1%.

The yeast vermicelli are frozen between -18°C and -20°C in about 20 to 30 minutes and packaged on the on hand in air, on the other hand in a neutral gas aft r freezing.

These bags are kept at -20°C: th gassing power of

the fresh yeast before drying and freezing and of the particulate frozen yeast with about 77% dry matter as obtained is measured after 1 month, 2 months and 3 months of preservation at -20°C.

The fermentative activites or gassing powers obtained, measured in the Burrows and Harrison fermentometer according to the test A_1 disclosed in U.S. patents No. 4,370,420 or 4,396,632, incorporated by reference, remain for the particulate frozen yeasts with about 77% dry matter kept in preservation, within the range comprised between 97% and 101% of the value obtained from the same amount of dry matter of fresh yeast with 33% of dry matter which has been used for obtaining the above-mentioned particulate frozen yeasts. No significant loss of fermentative activity is observed.

The frozen yeast having a dry matter content of about 77% and occurring in the form of vermicelli remains fluid, that is to say that the particles of short vermicelli are very easy to disaggregate and hence to handl and to use. They have a good free flowability.

EXAMPLE 2

A frozen baker's yeast in short vermicelli of diameter 0.5 to 1 mm, having a dry matter content of about 77% is prepared as in Example 1. The starting material is a fresh yeast having a content of about 7% of nitrogen with respect to dry matter and having a content of more than 15% of trehalose with respect to the dry matter. The frozen particulate yeast obtained is kept for 11 weeks at -20°C.

During the preparation of the above particulate frozen yeast, a sample is taken of the yeast having about 77% of dry matter before freezing and this sample is kept for 11 weeks at +4°C.

An American commercial fresh yeast, marketed in the form of 1 pound blocks is sampled shortly after its production and it is transported by air to the test site

at +4°C. This fresh yeast had at the time of the test o the manufacture of frozen doughs disclosed below, a dry matter content of 30% and a content of nitrogen with respect to dry matter of 9.1%.

A commercial instant dry yeast of good quality with 95% of dry matter was also used.

These 4 yeasts are tested in a bread-making trial of type U.S. White Bread, scheme No-time dough from frozen doughs. The 4 yeasts are incorporated directly by blending with the flour, which is very penalizing for instant dry yeast which will find itself in contact with a flow of water at 3°C and a very cold dough. An instant dry yeast rehydrated under good conditions at at least 30°C and having been able to reconstitute its cell membranes will give a performance at least equal to the control American fresh yeast. The particulate frozen yeast having about 77% of dry matter, kept 11 weeks at -20°C is incorporated directly without prior thawing.

The U.S. White Bread formula used has the following composition:

U.S. flour	100	parts by weight
water	57	" "
salt	2.25	" "
yeast dry matter	1.6	" "
sugar	8	" "
shortening	5	" "
Panodan 90 (Diacetyl tartaric ester of monoglycerides manufactured by GRINDSTED)	0.3	" "
ascorbic acid	100 ppm	
bromate 50/50	20 ppm	(pure bromate: 10 ppm)

The temperature of the doughs at the end of kneading is 15°C and the doughs obtained are immediately placed in a container at -40°C after moulding so as to freeze them to -20°C at the core. The duration between the end of

the kneading and the end of the moulding and hence the beginning of freezing is kept constant and equal to 25 minutes. The frozen dough pieces obtained are kept at -20°C. The dough pieces are thawed at the end of one, four, eight, twelve and sixteen weeks in a container at +26°C where they are brought to 4°C at the core in 135 minutes. Then, the proof time periods for a dough development at constant volume, i.e. to a template, in an incubator at 43°C and 94% relative humidity, are measured.

The following results are obtained:

	Proof-time expressed in minutes			
	Control fresh US yeast	Control dry yeast	Particulate yeast having 77% of dry matter kept 11 weeks at 4°C	Particulate yeast having 77% of dry matter, frozen, kept 11 weeks at -20°C
1 week	105	145	110	95
4 weeks	115	158	125	100
8 weeks	124	168	131	102
12 weeks	136	175	138	110
16 weeks	145	182	150	118

There is noted on the average over several tests an increase in the proof time expressed in minutes per week of preservation at -20°C of the frozen doughs:

control US fresh yeast ..... +2.6 minutes/week
control dry yeast ..... +2.4 minutes/week
frozen yeast, finely divided and free-flowing having about 77% dry dry matter, kept 11 weeks at -20°C +1.6 minute /week.

EXEMPLE 3

A frozen baker's yeast in short vermicelli of diameter 0.5 to 1 mm, having a dry matter content of about 77% is prepared as in Example 1. The strain used is NCYC No. 995 disclosed in U.S. Patent No. 4,496,632.

The cultivation of this strain is conducted essentially so as to obtain a fresh yeast with a relatively

high nitrogen content, equal or greater than 8%.

The emulsifier added to the fresh yeast is sorbit monostearate in proportion of 0.3% with respect to the dr matter of the yeast.

The analysis of the free flowing particulate froze yeast obtained is as follows (results of 8 tests):

		Average
Dry matter	74 to 80 %	77 %
Nitrogen on dry matter	7.9 to 8.6%	8.2%
Fermentative activity measured in the Burrows and Harrison fermentometer according to the above-mentioned test A_1, in 2 hours, notably disclosed in the U.S. Patent 4,396,632 ...	159 to 170 ml	162 ml of CO_2

The free flowing frozen particulate yeast obtained has a fermentative activity or gassing power of the same range as that of very active fresh compressed yeasts and a preservation at least equal to that of best dry yeasts, and an activity superior by the order of 25% to that of these dry yeasts.

EXAMPLE 4

A frozen baker's yeast in short vermicelli of diameter 0.5 to 1 mm, having a dry matter content of about 77% is prepared as in Example 1.

The strain used is an osmotolerant strain belonging to the group of strains NCYC R 30, NCYC 878, NCYC 996 or NCYC 890 disclosed in the U.S. Patents No. 4,328,250, 4,318,930 and 4,396,632.

These strains are multiplied as indicated in the aforesaid U.S. Patents. The emulsifier used is sorbitan monostearate in proportion of 0.3% with respect to the dry matter of the yeast.

The free flowing particulate yeast obtained having a dry matter content of about 77% has a fermentative activity or gassing power at least equal to 30 ml in test

A_4, in one hour, and preferably at elast equal to 40 ml of CO_2 in test A_4, in one hour, described in the aforesaid U.S. Patents.

This free flowing particulate yeast is used for making Danish Pastry according to a formula of the type:

Flour	100	parts by weight
Sugar	15	" "
Shortening	15	" "
US fresh yeast + salts, oxidants and emulsifiers	15	" "
Water	50	" "

The kneading is performed in three steps in a double-casing horizontal mixer containing ice water at -18°C. The starting dough temperature is of 0°C and the final dough temperature is maximum 10°C.

In such a process, it is very difficult to use dry yeasts unless this yeast is rehydrated at at least 20°C and after 1 hour, the yeast cream obtained is cooled down.

3 to 5 parts by weight of the free flowing particulate yeast is incorporated directly into the dough in place of the 15 parts by weight of fresh compressed yeast to obtain at least the same dough development.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A frozen baker's yeast in the form of free flowing particles having a diameter of less than 3 mm and a dry matter content of from 70 to 85 percent by weight.

2. A frozen baker's yeast according to claim 1, having a dry matter content comprised between 72 to 80 percent by weight.

3. A frozen baker's yeast according to one of claims 1 and 2, having a dry matter content comprised between 74 to 80 percent by weight.

4. A frozen baker's yeast according to any one of claims 1 to 3, wherein the free flowing particles have a diameter of less than 1 mm.

5. A process for the manufacture of frozen baker's yeast according to any one of the preceding claims, which comprises:

a) dividing by extrusion fresh yeast into individual particles of less than 3 mm in diameter and bringing the particles by gentle drying to a dry matter content comprised between 70 and 85 percent by weight;

b) cooling quickly and freezing the dried particles to a temperature of between -5°C and -30°C by fluidization in an air flow at a temperature between -10°C and -40°C; and

c) recovering the frozen particles.

6. A process according to claim 5, wherein the air flow is at a temperature comprised between -18°C and -40°C.

7. A process according to any one of claims 5 and 6, wherein the fresh yeast is divided by extrusion to a diameter of less than 1 mm.

8. A process according to any one of claims 5 to 7, wherein the fresh yeast is dried to a dry matter content comprised between 72 and 80 percent by weight.

9. A process according to any one of claims 5 to 8, wherein a protective additive is added to the yeast before extrusion.

10. In a process for manufacturing frozen doughs wherein yeast is added to dough and the resulting mixture is frozen to yield a frozen leavened dough, the improvement consisting of adding the baker's yeast of any one of claims 1 to 4 to the dough prior to the freezing of the dough.

11. Frozen baker's yeast obtained by the process according to any one of the claims 5 to 9.

DATED this 21st day of January, 1991.
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